

Microbial Biotechnology (MR)

Master of Microbial Biotechnology Degree Requirements

Code	Title	Hours	Counts towards
Microbiology / Science Core Courses		6	
Select two of the following courses:			
MB 555	Microbial Biotechnology		
MB 714	Microbial Metabolic Regulation (Recommended)		
MB 751	Immunology		
MB 758	Microbial Genetics & Genomics		
MB 590	Topical Problems (Environmental Microbiology and Biotechnology)		
PB 580	Introduction to Plant Biotechnology		
Science Elective		3	
Select a course from "Science Electives" listed below			
Internship Course		3	
MB 620	Special Problems		
Industrial Case Studies		12	
MB 585	Industry Case Studies in Microbial Biotechnology		
MB 590	Topical Problems		
Biotechnology (BIT) / Biomanufacturing (BEC) Core Courses		4	
BEC 525 & BEC 545	Molecular Biology for Biomanufacturing and Cell Line Development for Biomanufacturing ¹		
or BIT 510	Core Technologies in Molecular and Cellular Biology		
BIT or BEC Electives		4	

Select two courses from "Biotechnology (BIT) and Biomanufacturing (BEC) Electives" listed below

Business Core Course		3
MBA 585	Current Topics in BioSciences Management	
MBA Electives		6
Select two courses from "Master of Business Administration (MBA) Electives" listed below		
Total Hours		41

¹ Incoming students may be able to opt out of this requirement if they can provide sufficient evidence that indicates basic experience and understanding of technologies including recombinant DNA procedures, gene expression, isolation and identification of nucleic acids and proteins. Evidence may include a letter from current or former supervisors and/or professors attesting that the applicant possesses at least basic understanding and experience. Applicants with doctoral training in a related area may opt out of BIT 510 OR BEC 540, with MMB approval.

Science Electives

Code	Title	Hours	Counts towards
Select one course below			
Biological and Agricultural Engineering (BAE)			
BAE 525	Industrial Microbiology and Bioprocessing	3	
BAE 528	Biomass to Renewable Energy Processes	3	
Biochemistry (BCH)			
BCH 553	Biochemistry of Gene Expression	3	
BCH 555	Proteins and Molecular Mechanisms	3	
BCH 571	Regulation of Metabolism	3	
BCH 701	Macromolecular Structure	3	
BCH 703	Macromolecular Synthesis and Regulation	3	
BCH 705	Molecular Biology Of the Cell	3	
BCH 751	Biophysical Chemistry	3	
Comparative Biomedical Sciences (CBS)			

CBS 565	Fundamentals of Biomedical Sciences	3
Food Science (FS)		
FS 502	Chemistry of Food and Bioprocessed Materials	4
FS 553	Food Laws and Regulations	3
Genetics (GN)		
GN 521	Molecular Genetics	3
GN 730	Fungal Genetics and Physiology	3
GN 735	Functional Genomics	3
Microbiology (MB)		
MB 501	Biology of Plant Pathogens	3
MB 505	Food Microbiology	3
MB 532	Soil Microbiology	4
MB 575	Introduction to Mycology	4
MB 718	Introductory Virology	3
MB 725	Fermentation Microbiology	3
MB 730	Fungal Genetics and Physiology	3
MB 751	Immunology	3
MB 758	Microbial Genetics & Genomics	3
MB 774	Phycology	3
Plant Biology (PB)		
PB 580	Introduction to Plant Biotechnology	3
Plant Pathology (PP)		
PP 530	Agriculture, Ethics and the Environment	3
Statistics (ST)		
ST 511	Statistical Methods For Researchers I	3
ST 512	Statistical Methods For Researchers II	3
ST 513	Statistics for Management and Social Sciences I	3
ST 520	Statistical Principles of Clinical Trials	3

Toxicology (TOX)

TOX 515	Environmental Toxicology	4
TOX 710	Molecular and Biochemical Toxicology	3

Biotechnology (BIT) and Biomanufacturing (BEC) Electives

Code	Title	Hours	Counts towards
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Select two courses below**Biotechnology (BIT)**

BIT 501	Ethical Issues in Biotechnology	1	
BIT 562	Gene Expression Analysis: Microarrays	2	
BIT 563	Fermentation of Recombinant Microorganisms	2	
BIT 564	Protein Purification	2	
BIT 565	Real-time PCR Techniques	2	
BIT 566	Animal Cell Culture Techniques	2	
BIT 567	PCR and DNA Fingerprinting	2	
BIT 568	Genome Mapping	2	
BIT 569		2	
BIT 581	Plant Transformation	2	
BIT 595	Special Topics	1-6	
BIT 815	Advanced Special Topics	1-6	

Biomanufacturing (BEC)

MB 520	Fundamentals of Microbial Cell Biotransformation	2	
BEC 532	Foundations of Downstream Processing and Formulation	2	
BEC 536	Introduction to Downstream Process Development	2	
BEC 575	Global Regulatory Affairs for Medical Products	3	
BEC 580	cGMP Fermentation Operations	2	

BEC 585	cGMP Downstream Operations	2
BEC 595	Special Topics in Biomanufacturing	1-6

Master of Business Administration (MBA) Electives

Code	Title	Hours	Counts towards
Select two courses below			
MBA 505	Essential Economics for Managers	2	
MBA 530	Leading People	3	
BUS 554	Project Management	3	
MBA 555	Product Design and Development	4	
MBA 570	Opportunity Evaluation and Value Creation	3	
MBA 576	Technology Entrepreneurship and Commercialization I	3	
MBA 577	Technology Entrepreneurship and Commercialization II	3	
MBA 586	Legal, Regulatory and Ethical Issues in Life Science Industries	3	
MBA 590	Special Topics In Business Management	1-6	

School. Admission is contingent on meeting eligibility requirements at the time of entering the graduate program.

Faculty

Full Professors

Jose Bruno-Barcena

Amy Michele Grunden

Christine Hawkes

Michael Hyman

Scott M. Laster

Eric S. Miller

Assistant Professors

Manuel Kleiner

Adjunct Faculty

Jason Caplan

Accelerated Bachelor's/Master's Degree Requirements

The Accelerated Bachelors/Master's (ABM) degree program allows exceptional undergraduate students at NC State an opportunity to complete the requirements for both the Bachelor's and Master's degrees at an accelerated pace. These undergraduate students may double count up to 12 credits and obtain a non-thesis Master's degree in the same field within 12 months of completing the Bachelor's degree, or obtain a thesis-based Master's degree in the same field within 18 months of completing the Bachelor's degree.

This degree program also provides an opportunity for the Directors of Graduate Programs (DGPs) at NC State to recruit rising juniors in their major to their graduate programs. However, permission to pursue an ABM degree program does not guarantee admission to the Graduate